LAB REPORT

Data Communication and Networks

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PREFACE

This lab report is about establishing a Home Network topology on Cisco Packet Tracer software.

We learned and performed this experiment under the constant guidance of Rituraj Sir.

Throughout performing this experiment, we learned about protocols of data communication and networking and worked on the TCP/IP model. We performed our experiment on Cisco Packet Tracer which gives a real-time simulation of the network topology.

We would like to thank Rituraj Sir who gave us this opportunity to learn and work under his mentorship and we believe Learning never stops.

Group 12

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TITLE

HOME NETWORK SETUP

OBJECTIVE

- AIM OF THE EXPERIMENT

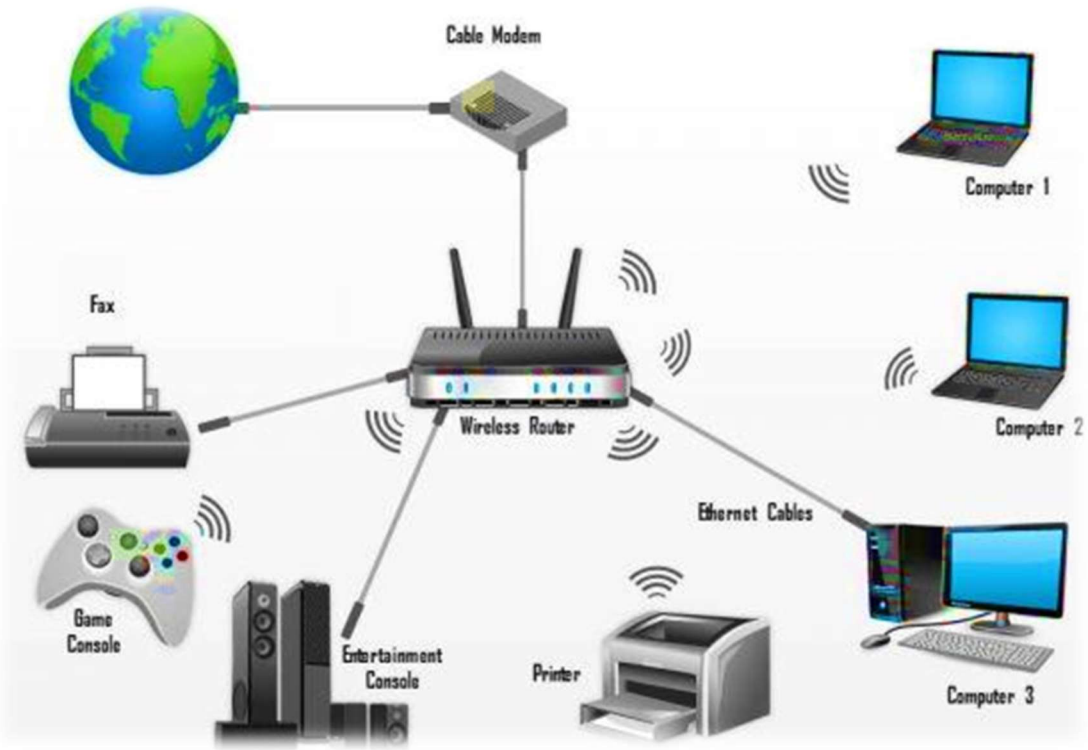
Configuration of a home network topology using Cisco Packet Tracer software.

THEORY

Today almost every home and small office have a local network and an Internet connection.

The home network or small office network enables multiple devices e.g. PCs, tablets, laptops, smart phones, etc. to connect, and also to connect to the internet.

In this experiment we aim to build and setup a home or small office network.

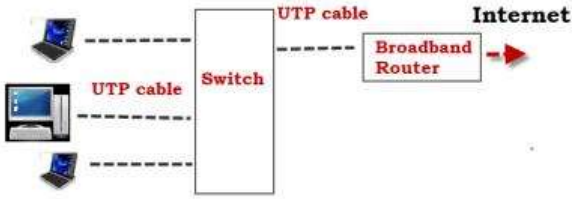


THEORY

Choosing a Wired or Wireless Network.

Wired Networks

Wired networks use **Ethernet over UTP cable** and tend to be faster than wireless networks, which is an important consideration if you are a gamer. The simple **wired home network diagram** below shows a minimum setup with a switch and broadband router.



Simple Wired Home Network Diagram

❖ Advantages

- Fast typically 100 Mbps to 10 Gbps
- Secure and reliable.

❖ Dis-Advantages

- Doesn't work with devices that don't have an Ethernet port e.g. tablets and smart phones.
- Not so easy for visitors and mobile devices (laptops) to connect to.
- Not so easy and fast to setup as it requires running cables. However Home plug or powerline adapters can be used instead.

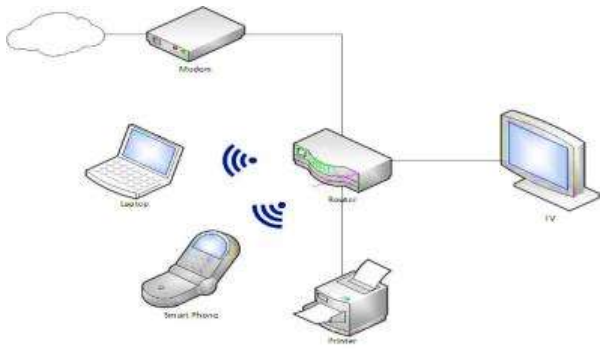
❖ Uses

- Used for network backbone i.e. connecting between router, network switches and wireless access points on different levels (floors).

THEORY

Wireless Networks

Wireless networks use **Wi-Fi.** and are quick and easy to install, but are generally slower than wired networks.



❖ Advantages

- Easy to setup from an end user perspective.
- Allows easy access to smart phones, Tablets and mobile devices.
- No cables to run.

❖ Dis-Advantages

- Not as Secure as wired networks without proper configuration. and easy to setup insecurely.
- Not so as fast as wired networks.
- Not as reliable as wired networks.

❖ Uses

- Connecting peripheral devices like computers, smart phone, tablets etc.

Most home networks will use a mixture of **wired** and **wireless**.

THEORY

Setting up a Home Network -Components and Structure.

Today however most home and small home office networks will use a **wireless network** or mixed network, as most people use Smart phones, and tablets which don't have Ethernet support.

The main components required to build a typical home/small office network are:

- **Router or Wireless Router -** Connects the network to the Internet.
- **Ethernet Hub or Switch -** Used to Connect Ethernet equipped devices.
- **Copper Straight Wire with RJ45 connectors.**

The **home network diagram** below shows the structure of a typical small home network:

Network Diagram-Typical Simple Home Network

Home Router Setup

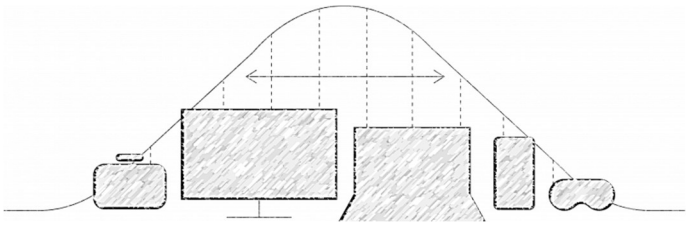
To administer the router, you access it via a web browser, and login using a username and password.

Before you allow devices to connect to your home network you should make some basic changes to the default setup parameters of your router.

The two important one is the **SSID** used to access the Router and the **router admin password** as the default username/passwords are well known, and published on the Internet.

Connecting Wi-Fi Devices

Most wireless access points and wireless routers can theoretically have 255 devices connected at a time. That represents a lot of computers, smartphones, tablets, cameras, and other devices and probably far exceeds the needs of the typical home. Keep in mind that each computer or device that's added to your network will reduce the bandwidth available to the other devices using the same Internet connection.



Security over Wi-Fi Devices

The standard way of connecting a Wi-fi device to a Wi-fi network is the connect to the network and enter the password when prompted.

However most modern Wi-Fi routers/hubs support a feature called **WPS** (Wi-fi protected setup). Which usually involves pressing a button on the Wi-Fi router and a corresponding WPS connection button on the Device.

Home Network IP Address

All of your devices will need an IP address. This is provided automatically by a service called **DHCP** which, by default, is provided by the home router.

IP address provided by the DHCP server are known as **dynamic address** as they can change. You can also assign addresses manually, and these are known as **static addresses**.

Data & Observation

What we are building?

We are creating a small network which has 3 Laptops, 1 PC, 1 Printer and 5 Smartphones in its network.

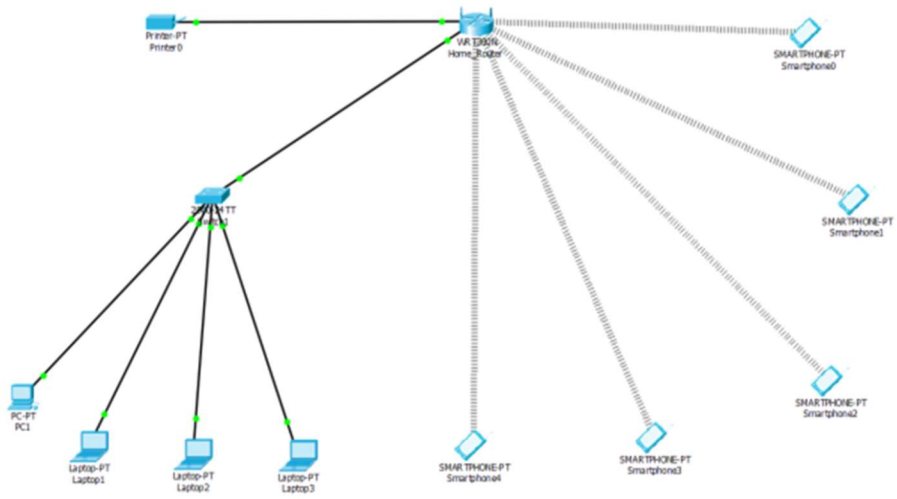
Since, PC, Laptops and Printer can be static at a position, so we can create their connectivity over wired network. One of the advantages of wired network is its speed and reliability.

Therefore, PC and Laptops are connected with switch and switch is directly connected to router. Printer can be connected with router directly or with switch indirectly.

As the smart phones are not static over a place. They keep moving sometimes inside the home and sometimes outside the home. So, we cannot provide its connectivity using wired network.

So, we use a wireless router to connect all the smartphones.

Finally, our network will look like this:

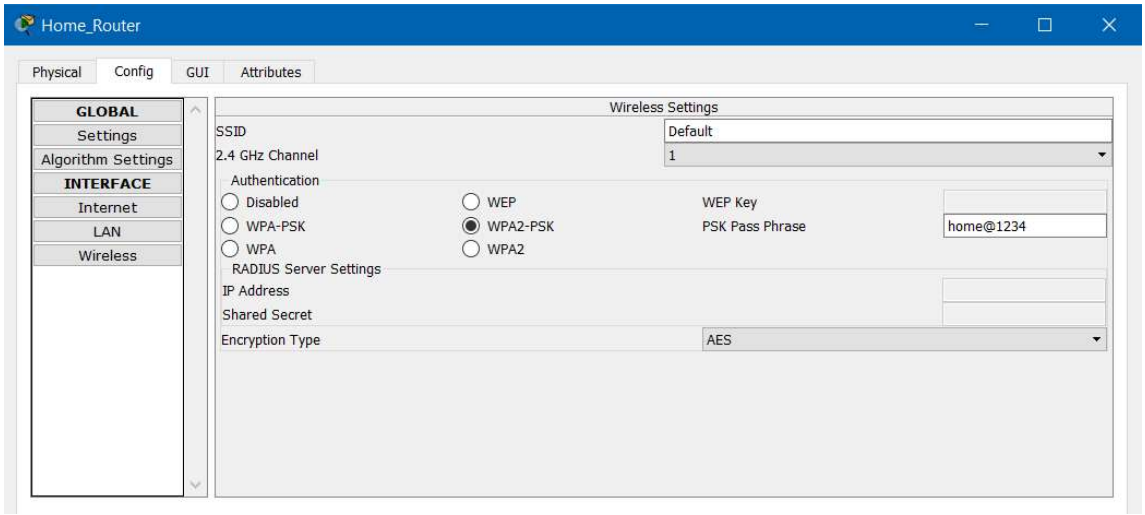


Data & Observation

Steps to build Logical Configuration this home network.

1. Add the 1 router, 1 switch, 1 printer, I PC, 3 Laptops and 5 smartphones to the dashboard from wireless devices, network devices and end device.

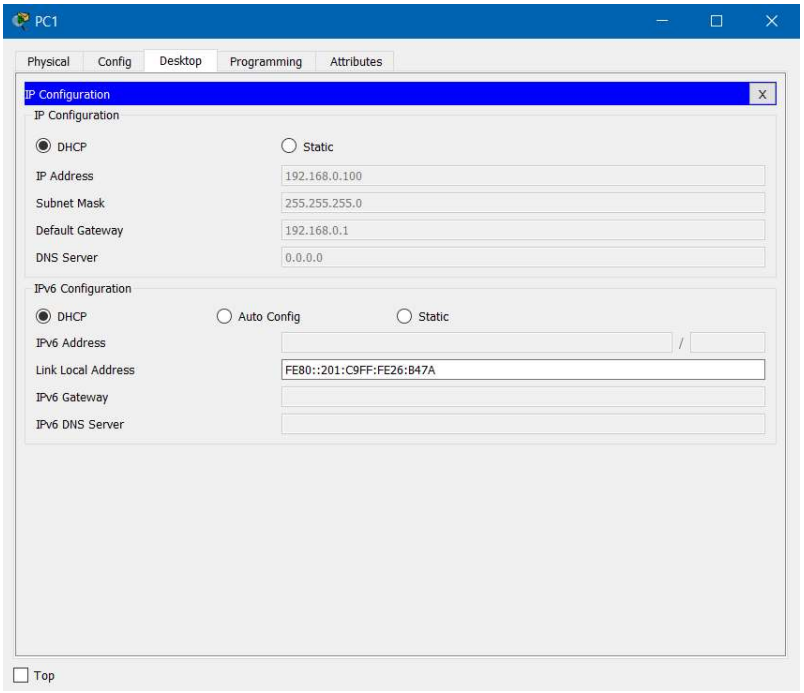
2. Configure Router with IP Configuration DHCP and wireless authentication WPA2-PSK with a password home@1234.



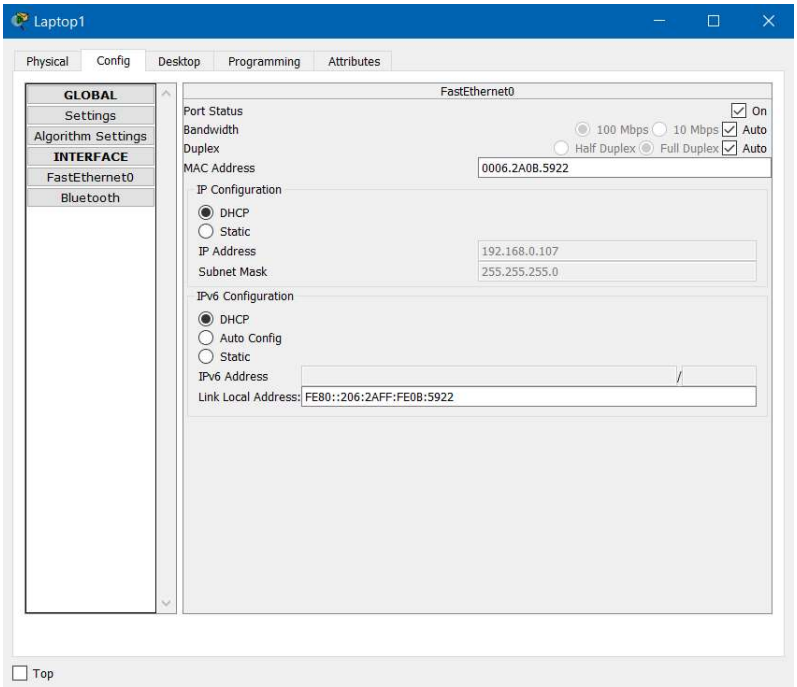
3. Connect Switch and Router using copper wire at Fast Ethernet Port.

4. Configure PC with IP configuration DHCP and connect it with switch using copper wire at Fast Ethernet Port.

Data & Observation

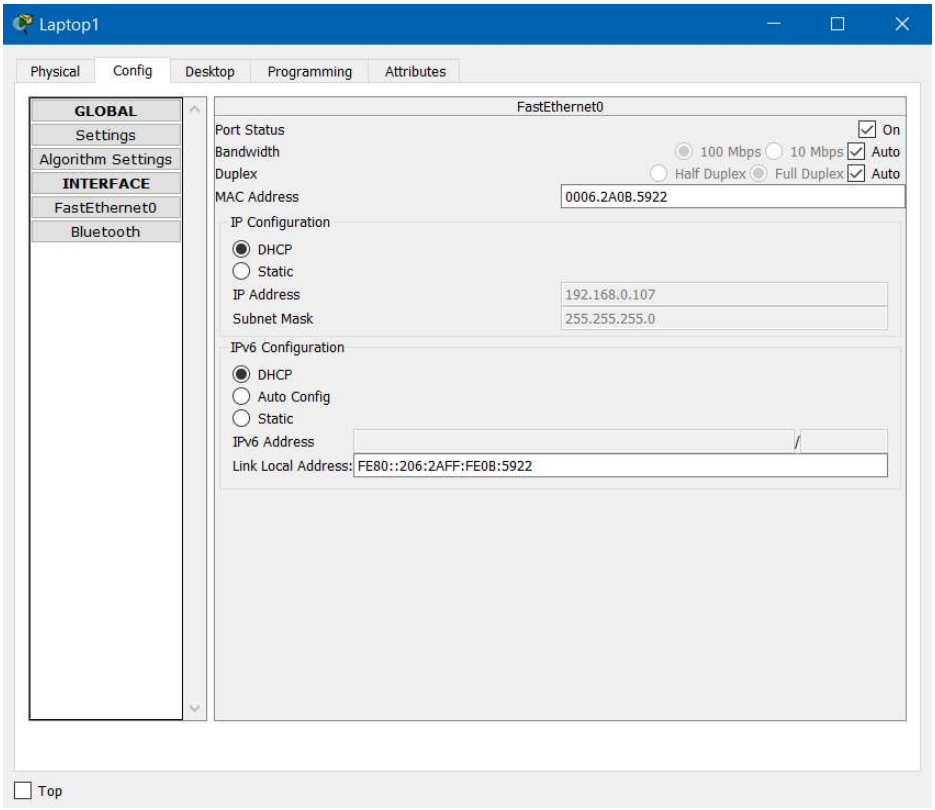


5. Configure Laptops with IP configuration DHCP and connect it with switch using copper wire at Fast Ethernet Port.



Data & Observation

6. Configure Laptops with IP configuration and connect it with switch using copper wire at Fast Ethernet Port.

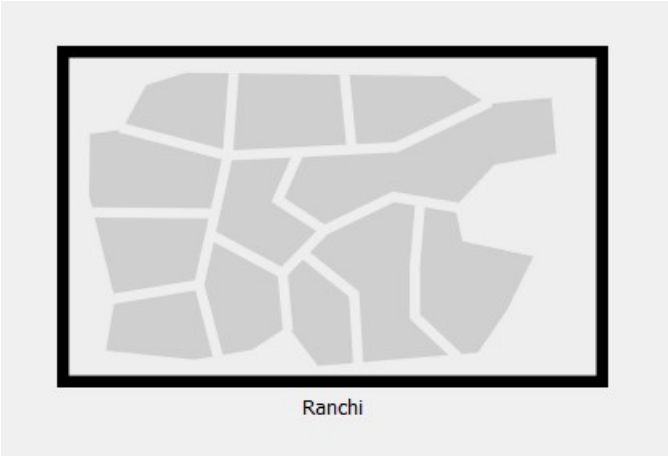


7. Finally, switch on the router.

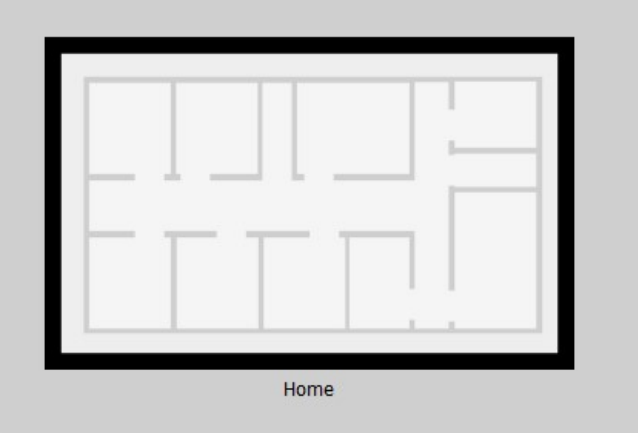
Data & Observation

Steps to build Physical Configuration this home network.

1. Create a city “Ranchi”.



2. Inside city Ranchi, create a home where we have to setup the network.



Data & Observation

3. Inside this Home, let us first move all the devices on the closet. Let smart phones roam outside.

4. Finally, inside the closet you can see networking devices. You can also move them as per your need. You can also add more closets if you want to expand your network.

Data & Observation

Realtime OUTPUT

After the successful setup and configuration of all the devices within the network, we can see that all the status led is displaying green color which means the connection is established between devices. Now let us see if our ping is received by other members of the network.

PDU List Window

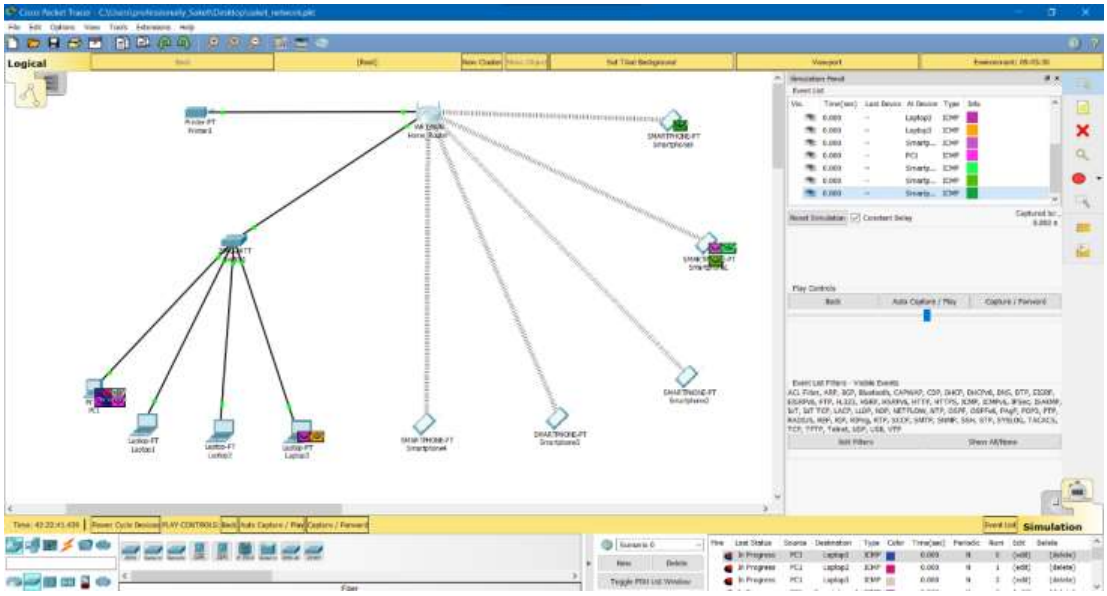
Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC1	Laptop1	ICMP		0.000	N	0	(edit)
	Successful	PC1	Laptop2	ICMP		0.000	N	1	(edit)
	Successful	PC1	Laptop3	ICMP		0.000	N	2	(edit)
	Successful	PC1	Smartphone4	ICMP		0.000	N	3	(edit)
	Successful	PC1	Smartphone1	ICMP		0.000	N	4	(edit)
	Successful	Laptop3	Printer0	ICMP		0.000	N	5	(edit)
	Successful	Laptop3	Laptop2	ICMP		0.000	N	6	(edit)
	Successful	Smartphone1	Printer0	ICMP		0.000	N	7	(edit)
	Successful	PC1	Printer0	ICMP		0.000	N	8	(edit)
	Successful	Smartphone1	Smartphone4	ICMP		0.000	N	9	(edit)
	Successful	Smartphone1	Smartphone2	ICMP		0.000	N	10	(edit)
	Successful	Smartphone0	Smartphone3	ICMP		0.000	N	11	(edit)

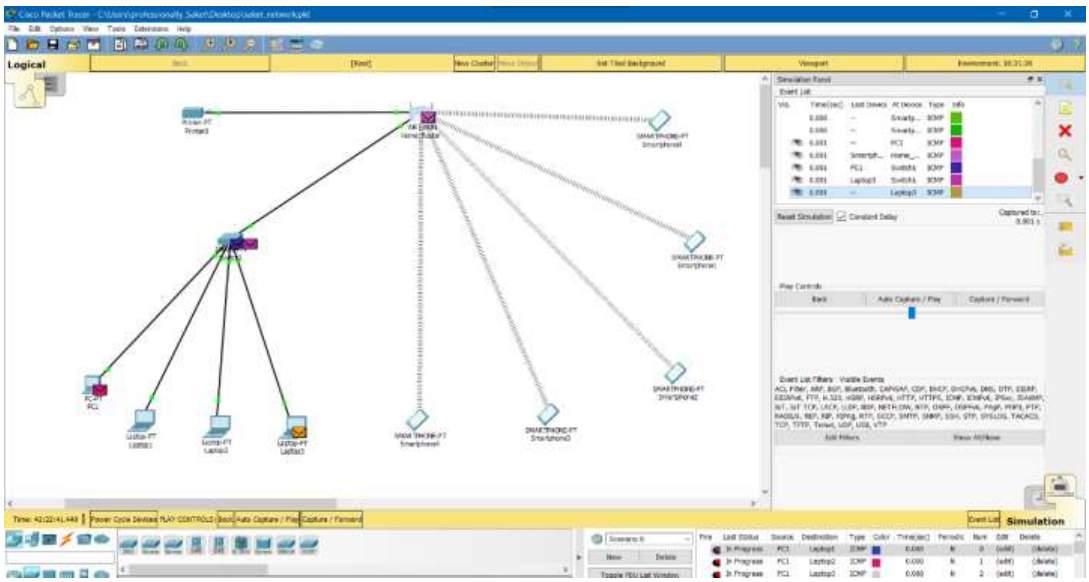
Here we can see that all the connections between devices are successful and devices can ping each other.

Data & Observation

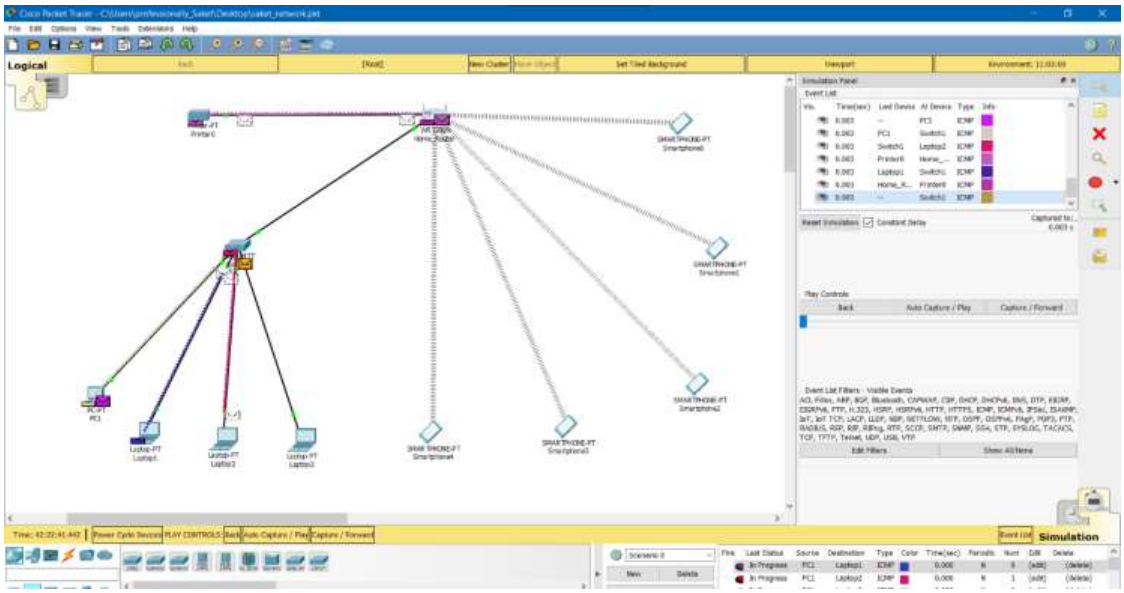
Simulation OUTPUT

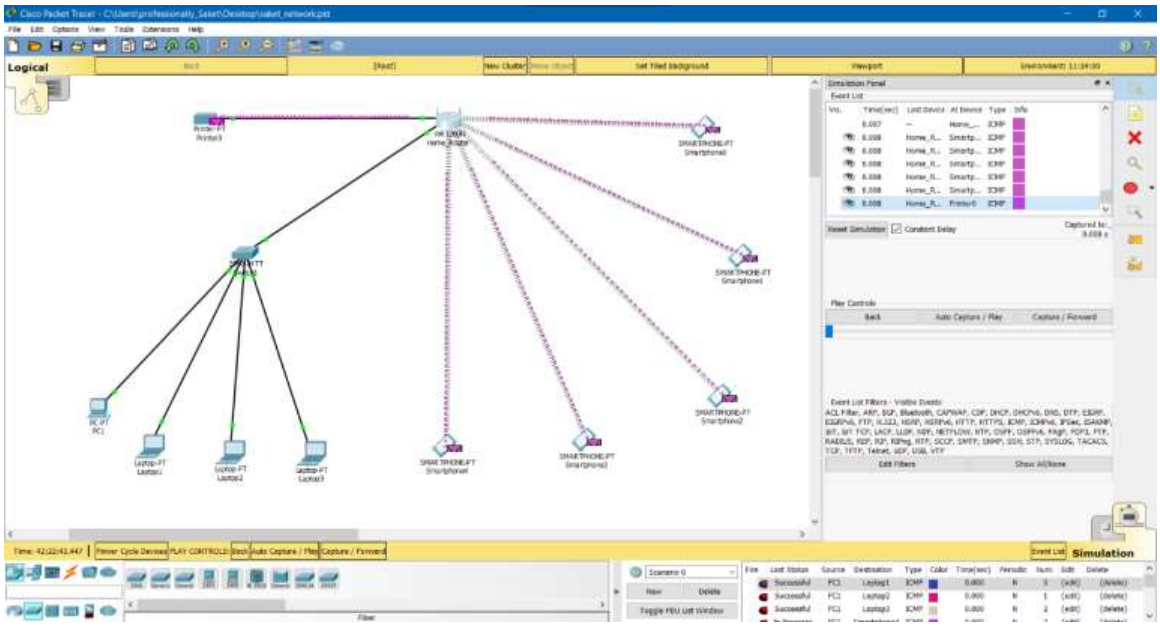
To observe the flow of data from source device to destination device we switch to simulation mode.





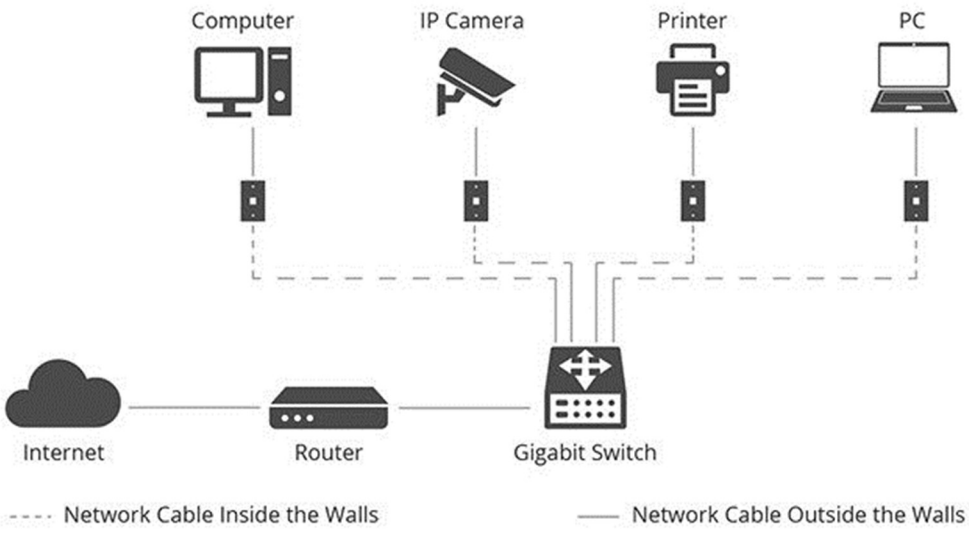
Data & Observation





Discussion & Conclusion

By themselves, computers are powerful tools. When they are connected in a network, they become even more powerful because the functions and tools that each computer provides can be shared with other computers. Network is a small group of computers that share information, or they can be very complex, spanning large geographical areas that provide its users with unique capabilities, above and beyond what the individual machines and their software applications can provide.



The ultimate goal of any network is to allow multiple devices to communicate.

Discussion & Conclusion

While choosing a suitable device between Hub & Switch, we preferred switch because:

- Switch is more efficient than hub.
- A switch can join multiple computers within one LAN.
- Switch is smarter than Hub to determine the target of the forwarding data.

The reason why we chose DHCP (Dynamic HOST Configuration Protocol) for assigning IP Configuration:

- There is less chance that two devices will have same IP address.
- Static IP configuration is time consuming and has a greater chance of error.

The reason for using Wireless Routers:

- It gives greater control over our home network.
- Enable guest networks for visitors and set restrictions and cut off internet access as per requirements.
- More intelligent and sophisticated than switch.
- It can link with both wired and wireless network.

The reason why we are using WPA2 security:

- Prevention of unauthorized access in our network.

Discussion & Conclusion

Final Discussion

Hence, the establishment of proposed Home Network has been done in the simulated environment. The routers, PC, switch and the Smart Phones were configured accordingly. Packets were sent from one computer to the other and the transmission of such data to their destination was successful in an efficient manner. For security facilities to the network various methods are implemented like password protection is also applied on the wireless routers for restricted usage and which can be used only for library. Testing was done for the simulated network and it performed like a real computer network. This shows that this home network will work perfectly when implemented in real-time situations.

Final Conclusion

Hence, we conclude, this proposed idea helps in designing the network topology for a home or small office network, that provides the different functionalities within a single network such as security of the network, wireless area network, mobility, operational efficiencies and a costs effective network for better small-scale business and home networks.

Thank You
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